



TARA BrickMek-SUPER

USER MANUAL

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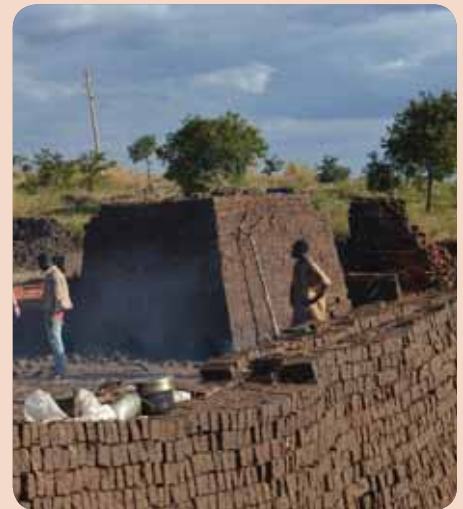
Preface



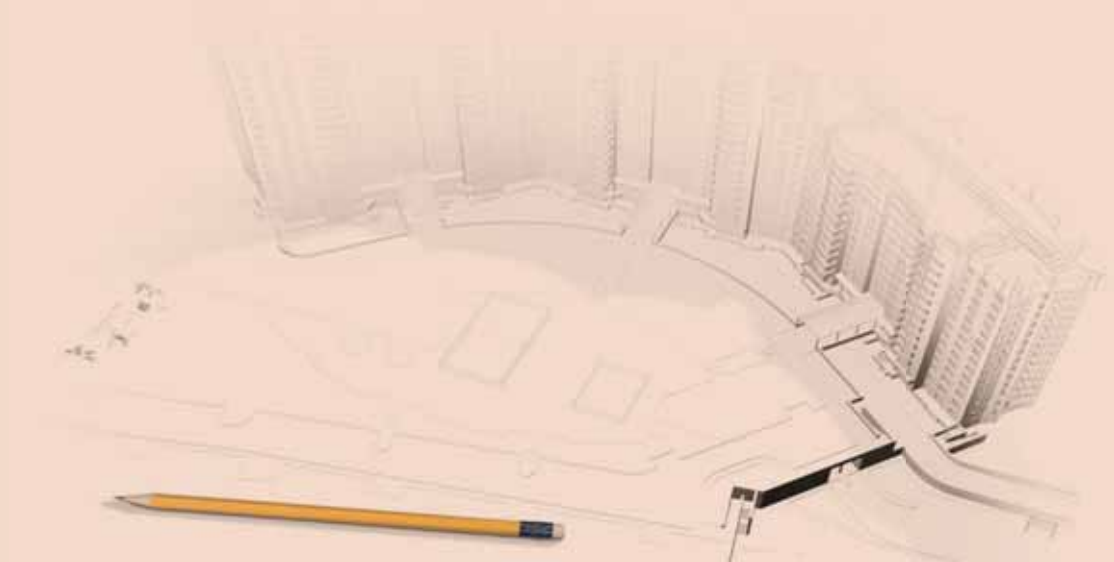
This user manual has been developed in response to the interest in Malawi in understanding the process of production of green bricks. It aims to describe the methods of production of green bricks through the TARA BrickMek-Super. The manual also explains in detail the methods of management of manpower, trouble shooting and maintenance of the machine.

This user manual is expected to serve as a basic tool for the workers and supervisors in a kiln to delineate the essential parameters of operating the TARA BrickMek-Super and producing green bricks.

This manual doesn't claim to be complete or perfect. It is in the hands of users to utilise it fully by using it as a reference guide for further improvement. The authors would appreciate if you could share your ideas and work experiences to further improve this user manual.



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Acknowledgement

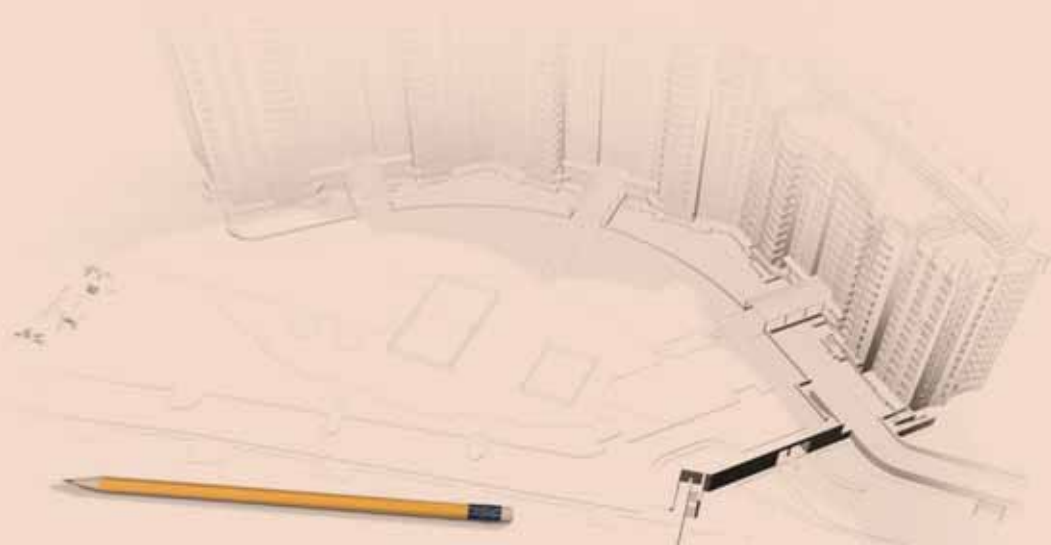


During the course of developing this manual, every effort was made to include the existing knowledge base, along with interactions between personnel associated with the technology.

We would like to acknowledge the support of various organizations, TARA Machines and Tech. Services Pvt. Ltd., India; Centre for Community Organization and Development (CCODE), Lilongwe, Malawi; Eco bricks Limited, Lilongwe, Malawi and IPE Global, New Delhi; who have whole heartedly contributed towards developing the same. Our sincere thanks to various individuals, whose views have been accessed personally, through one-to-one interactions, the internet and printed documents.

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Machine Features



TARA BrickMek is a green clay brick moulding machine powered by either 7.5HP, 3 Phase induction electric motor or 10HP diesel engine. A sewage pump is fitted for watering of soil & also cleaning the stainless Steel fabricated moulds. The four wheeled machine can be towed at the moulding site.

The TARA BrickMek has been designed to mix easily soil, industrial waste (flyash, coal dust, etc.) and water into a homogeneous mix produce to produce consistent quality of green bricks with frogs. The machine has a rated capacity of 1440 or 1620 bricks per hour.

Worm blade

Worm shaft

Worm blade



Worm shaft with angular placed adjustable blades for mixing and pushing the soil mix to the mould



1. Soil Feeding Hopper
2. Water Tank
3. Water (Sewage) Pump
5. Mould Pushing Arm to push the moulds for filling and finally to the sliding platform after being scrapped the excess soil
7. Switch Box
15. Parting Sand Stacking Chamber and Opening
16. 7.5HP Induction Motor
17. 10HP Diesel Engine
18. Diesel Tank
21. Mould assembly
22. Brick Demoulding Handle



Components of TARA BrickMek-Super

Mould cleaning chamber for cleaning the moulds after the bricks get de-moulded



Parting sand box



Outlet of parting sand



Components of TARA BrickMek-Super

- | | |
|--------------------------------------|-------------------------------|
| 4. Drainage Screw | 10. Scrapping Tool |
| 6. Safety Bolts | 11. Sliding Platform |
| 8. Tow | 13. Sliding Platform Adjustor |
| 9. Sliding Platform Releasing Handle | 14. Mould Cleaning Chamber |
| | 18. Tool Box |



Mould cleaning chamber for cleaning the moulds after the bricks get de-moulded



Empty mould with sprayed parting sand



Filled and scrapped mould with soil

Function of Machine Components



S. No	Items	Functions
1	10 HP Diesel Engine	Single cylinder engine is used to drive the worm shaft assembly, the mould pushing arm and the water pump. (It works only when induction motor is OFF)
2	7.5HP, 3Phase Induction Motor	The motor is used to drive the worm shaft assembly, the mould pushing arm and the water pump. (It works only when diesel engine is OFF)
3	Brick demoulding handle	By lifting both handles at a time, the three green bricks are demoulded from the mould box.
4	Diesel Tank	To run the 10HP Engine, diesel needs to be filled in the 10L. capacity tank assembled with the engine
5	Drainage Screw	Two outlets for draining -out the waste water
6	Mould assembly	Stainless steel fabricated moulds fitted with frogs are used for shaping the green bricks.
7	Mould Cleaning Chamber	After demoulding of bricks, the moulds get cleaned while passing through the chamber.
8	Mould Pushing Arm	To push the mould towards the mould filling mouth and after filling, slide outside for de-moulding.
9	Parting Sand Stacking Chamber and Opening	For easy demoulding, parting sand is sprayed manually on the water cleaned mould.

S. No	Items	Functions
10	Rubber Tyres	To enable movement of the machine in the production yard.
11	Safety nuts	Two safety nuts with bolts are used to avoid excess load on the mould pushing arm.
12	Scrapping Tool	To scrape the excess soil from the top of the mould.
13	Sliding Platform	The roller assembly slides the filled moulds, ready for carrying to the demoulding yard.
14	Sliding Platform Adjustor	The bolts at the four end of the sliding platform
15	Sliding Platform Releasing handle	For removing mould (during non-working period/ power failure) the sliding platform can be lowered by operating the releasing handle.
16	Soil Feeding Hopper	To feed the soil mix, into the barrel of the machine.
17	Switch box	Electric switches are enclosed in the box.
18	Tool Box	The box for keeping the important tools like spanner, screw driver, hammer, nut bolts, oil can etc.
19	Tow	To direct the movement of the TARA BrickMek Machine at site.
20	Water (Sewage) Pump	Pumps the water from the water tank to distribution pipe, cleaning chamber and barrel.
21	Water Tank	To store water that circulates to the distribution pipe and the cleaning chamber through pump.
22	Worm Shaft	To mix the soil with the industrial waste and water and push it to the outlet for filling the mould.

Machine Parameters



Machine Parameter

The TARA BrickMek is a versatile machine designed to produce consistent superior quality soft clay bricks with frogs. The TARA BrickMek is a game-changer for overcoming drudgery of workers engaged in traditional, manual operations involving mixing, pugging and moulding of clay. The TARA BrickMek is easy to operate with one skilled machine operator assisted by local manpower (men & women). The TARA BrickMek increases the skills, productivity and earning capacity of women engaged in brick making.

Advantage:

- Robust machine for soft moulding of bricks; built up with a simple mechanism that ensures

homogeneous mixing of clay with different industrial waste additives like coal, flyash, sponge iron waste.

- High product quality – uniform size and shape with better surface finish & sharp edges.
- Customized sizes of bricks with desired frog
- Decentralized production – allows to operate at any moulding location, with or without availability of 3phase electric power
- Ease of Operation – the machine is easily operated by local manpower, simple changeover from diesel engine driven to motor driven mode is possible.

Specifications

Specifications	TARA BrickMek-Super	TARA BrickMek
Mould Sizes	Stainless Steel (SS-304) moulds are manufactured as per customer's requirement	
Mould quantity	32 nos.	24 nos.
Powered by	3phase, 7.5HP induction motor with 10 HP Diesel engine	3phase, 8.5HP (7.5+1) induction motor
Weight	2 tonnes	1.8 tonnes
Production capacity	1620 bricks/hr (rated)	1440 bricks/hr (rated)
Manpower	15nos.	13 nos.
Mould Transfer Trolley	4nos.	3 nos.
Bricks per stroke	3nos.	3 nos.

Machine Functions



Narrative of the machine operation

Soil Feeding

Soil with industrial waste is fed through the soil feeding hopper to the barrel of the machine

Soil Mixing

Soil mixing is done by addition of controlled quantity of water in the barrel

1. **HOMOGENISATION:** In the barrel, the angular blades assembly of the worm shaft allows easy and uniform mixing of the soil with water while pushing it towards the mould. Within the barrel, the Mixed soil is ready to be formed into bricks.

2. **EJECTION:** Mixed soil from the barrel is pressed into the mould assembly through the eccentric mechanism of the worm shaft.

Moulding Process

1. Moulds are fed into the machine where they are washed in the cleaning chamber, parting sand is sprayed and sanded moulds are fed into the stroke of the mould pushing arm.
2. Mould assembly is slid over the sliding platform for filling.

Demoulding Process

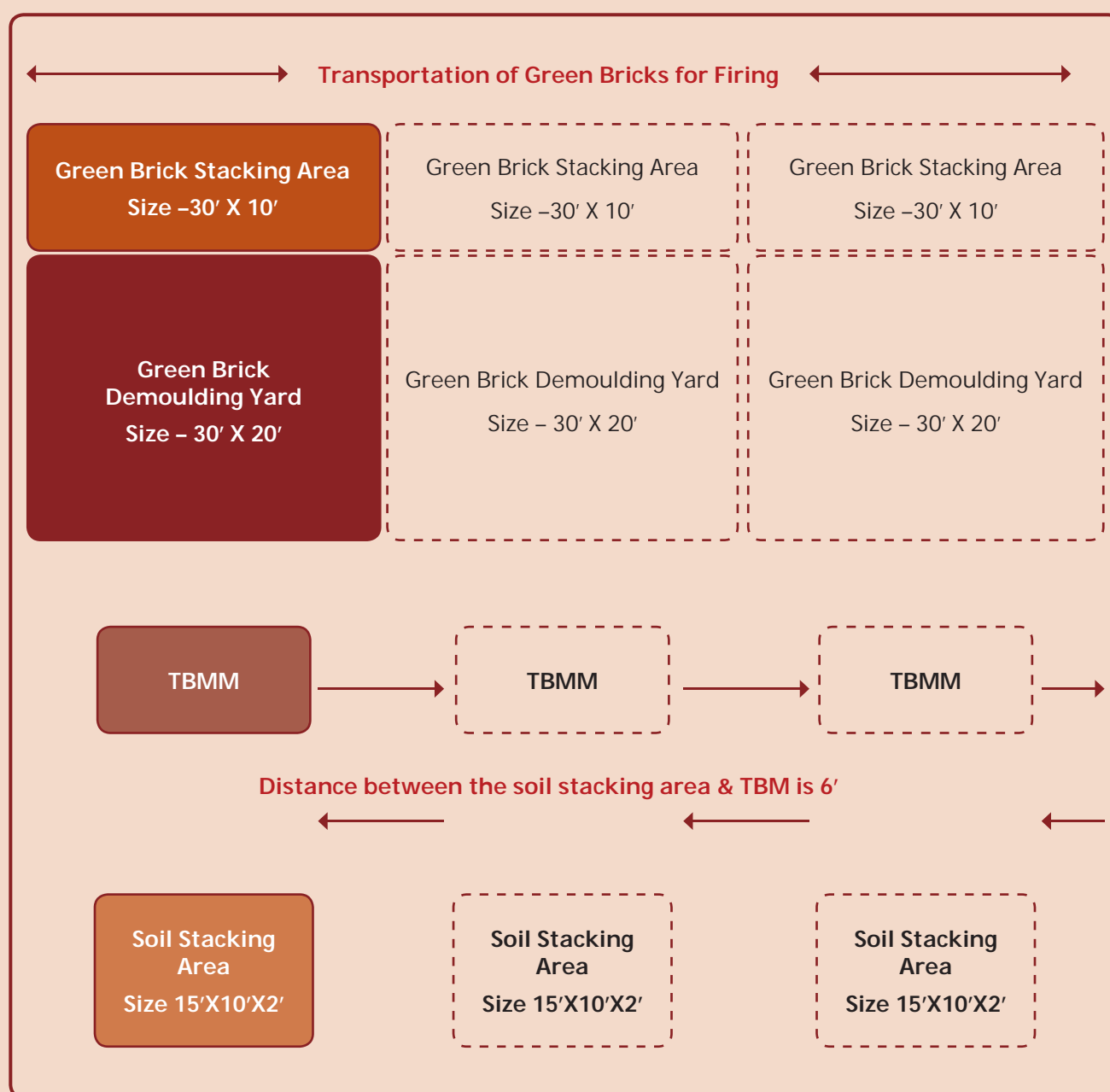
1. Soil filled mould assembly is lifted manually and carried to the de-moulding yard.
2. After positioning the mould at the de-moulding yard, the mould assembly is flipped up side down.
3. The operator lifts the mould while pressing the lever mechanism; the shaped green bricks are de-moulded on to the level ground surface.

Drying Process

1. The green bricks are laid on the de-moulding yard for drying to leather hard condition.
2. The bricks are stacked into stacks with a pattern such that air can easily pass through every bricks resulting in uniform drying of the bricks.
3. The dried brick are then transferred for firing in the kiln.



Installation Layout



Production yard plays a major role in the production of quality green bricks using TARA BrickMek. For development of the production yard, the essential requirements are as follows:

1. **Location for the movement of TBMM, soil stacking area, green brick demoulding yard, stacking area:** Based on the normal practice, the above layout is recommended; the layout may vary depending on the site and requirements of each entrepreneur.
2. **Surface of the green brick demoulding yard:** The surface finish of every brick depends upon the surface of the green brick laying platform. To achieve a uniform surface, the ground preparation is followed by few processes given in the following page 15.
3. **Drainage of the waste water from the machine:** After the end of the every working day, the bottom tank needs to be cleaned. The drained waste water is channelized to a sump to prevent damage to the dry surface of the demoulding yard.
4. **Transportation of the dry green bricks and the soil:** In the normal practice, the transportation of the dry green bricks and the soil is done through tractor trolley. So during the development of the production yard, the path of the movement of the tractor is determined to avoid damage to the surface of the green brick demoulding yard.
5. **Water and Electricity:** during the layout of the production yard, the water and electrical services are laid in a manner which avoids cross over of the service lines.
6. **Manpower movement & management:** To achieve the productivity of the green bricks, the movement of the manpower, involved in the production, plays a vital role. Their movement and management are explained in **Production Management** Page 26.
7. **Safety:** For the continuous production of the green bricks, the Production yard needs to be organized without hazards and encumbrances to ensure safety of workmen.



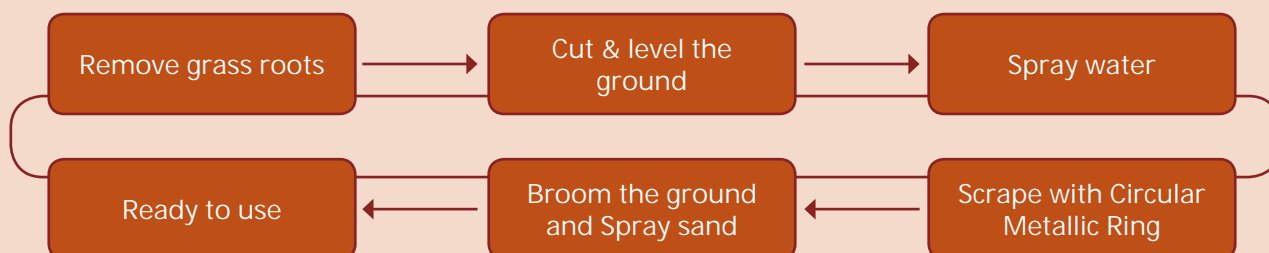
Uniform Surface of the Green Brick Laying Platform



Drainage of Waste Water from the Machine

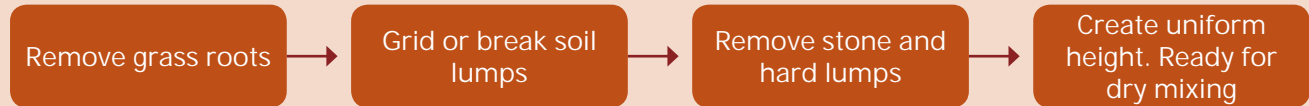
Ground Preparation

To achieve the smooth surface of the demoulding yard, the ground needs to be prepared as follows:



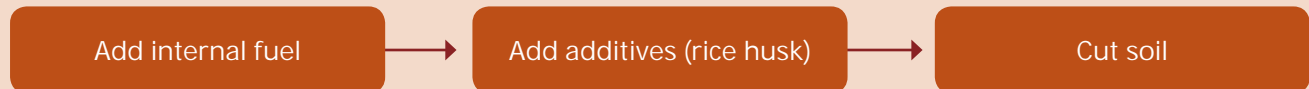
Soil Preparation

Based on the soil report, the specified soil needs to be dumped at the desired area and the process shown below for soil preparation should be followed:



Dry Mixing:

After the preparation of dump, additive should be spread evenly with uniform thickness on the soil surface:



Curing:

After the dry mixing, cure the soil mix with addition of water by the following process:

Wet Mixing:

After 24 hrs of curing, prepare final soil by:

- Adding required quantity of pore opening material like rice husk, saw dust etc. which is recommended.
- Cutting the soil vertically while ensuring all layers are being cut



Rice Husk Additive

Setting up the Machine



Setting up the Machine

- Unload the machine from the truck safely
- Set up the pipe line for water supply from permanent reservoir or tanks
- Set up the three phase electric supply to the machine 32Amp, 415V, 50Hz (TPN) and cable 4/6mm² (where electric supply is exists)
- Check and tighten all the nut bolts, which might loosen during transportation and unloading.
- Put oil and grease on the moving parts.
- Install valve to control the supply of water. Fill the water tank with clean water



Unloading of the TBMM from Truck

For Electric Motor

- Connect the machine's main switch box; direction of rotation is indicated on the machine
- Switch on the electric connection and switch on the 7.5HP electric motor
- Check the direction of rotation, if OK then go to next step but, if not OK then call an electrician and change the electric connection. Similarly switch on the 1HP Pump and check the water circulation. If OK otherwise check the connection



Manual Process of Starting the Engine



Method of Engaging the Diesel Supply Valve

by the electrician. Whereas for TARA BrickMek-Super no need to check as the pump is coupled with the 7.5HP Electric Motor.

For Diesel Engine

- Open the back cover and manually start the engine by rotating handle (1) and then engaging the diesel supply valve (2).
- Engage the V-Belts by operating the hand lever (3) to drive the Worm Shaft, Moulding Pushing system and Water pump.
- Check for any metallic sound or chatter. If YES, then find out area from where the metallic sound appears. Adjust the parts.
- Position the Metallic mould before the pushing arm and check the movement on the sliding table. If required adjust the height (4) and also the arm movement length (5).
- Check the pressure of water jet at the cleaning chamber.
- Check the movement of machine.
- Position the machine at the production yard near the soil source.
- Feed soil gradually with required amount of water at the hopper [Do not feed more soil and water at the initial stage].
- Check the moulding mechanism is working properly initially put mould after second or third.
- Check the green brick quality if OK then go to the next step but if not OK check the soil water ratio.
- Position the manpower at their location [described in Production Management Page 26].
- Start producing brick with an target of 500-700 brick/hr.
- Continue it for 2-3 days till the team is able to cope up with the mechanism and process.



Operation of Hand Lever



Adjustment of Height of Metallic Mould



Adjustment of Arm Movement Length of Metallic Mould

Warning

- Do not connect the electric motor directly from the main supply without the MCB, starter and main switch.
- Do not use any other external power [Diesel/Petrol Engine or Tractor] for transmission of power. Only use the designated motors or Diesel Engine.
- Do not attempt to disassemble or alter any part of the equipment that is not expressly described in this manual.



Production Process



How to Produce Bricks Using TARA BrickMek

1 Fill the bottom tank with water



2 Switch ON the Main Switch and Mini Circuit Breaker (MCB) at the main power supply. Then switch on the Motor and Pump



4 Fill the soil container by cutting of soil



3 For TARA Brickmek-Super Start the Diesel Engine, engaging the Diesel supply valve and then the hand lever for transmission of motion





Do's

Action likely to run the machine...



- Mix the dry soil and industrial waste uniformly
- Age the soil mix for 36hours
- Water to be added about 12-15% for non-plastic soil, 15-20% for semi-plastic soil and 20-25% for plastic soil

Spraying water during every feeding of soil at the hopper to run the machine with constant load



Spray parting sand on the mould after washing in the cleaning chamber. Uniform spray of parting sand results in better quality bricks.

Lock all the safety doors during running of machine



Replace and tighten both the 3/8" BSW safety bolts in their holes by check nuts.

Switch off the main switch during cleaning, servicing and trouble shooting



Don't's

Action likely to damage the machine ...

Do not switch on the Electric motor, when Diesel Engine is on

Do not feed excess soil. Excess soil will cause severe breakdown of the machine, by damaging the different parts like gears, bearings, keys, moving blades etc.

Do not put hands or metallic body inside the worm during running condition.



Do not put hands or tamper with the scrapping blades during running condition.

Do not put hands or tools inside the chain and sprocket during running condition.



Do not put hands or metallic parts inside the Gear assembly during running condition.

Do not put soil with grass roots, unseived stone dust, lump of hard soil or stone particle, high plastic soil, sandy soil and excess water. DO NOT RUN THE PUMP DRY.

Trouble Shooting



Common Problems Faced

Problem Faced	Step	Observation	Suggestive Solutions	Remarks
After switching on the MCB and Starter or engaging the lever for transmitting motion from Diesel engine, the Worm Shaft (Augur) is not rotating	1	Check if humming sound is coming from the electric motor	Switch off the starter and MCB, loosen the V-belts from the pulleys and then switch on the MCB & starter.	Before doing this activity, the soil inside the barrel, need to be softened by adding water.
	2	Check if the motor/diesel engine is not rotating	Call an electrician or engine mechanics and check the electrical connection or Engine	Check the Kirloskar Engine Guide for any other trouble
	3	Check if the motor/Diesel Engine is rotating	Check the tightness of the V-Belt. If loosen then tighten by shifting the position of motor. Then Check the tightness of chain. If loosen, then tighten the chain by shifting the Idler sprocket.	During this process, need to check any sound (shrill) is emerging or not.
	4	Check if the worm shaft is rotating properly i.e. driving assembly is aligned properly	Check the tightness of all the fasteners of pulleys, sprockets, gears (One person needs to keep the finger on the stop button- if any thing goes wrong then motor needs to be switched off immediately)	During this process, need to check the alignment of every rotating parts like gears, chain etc.
	5	Check if any sound occurs inside the barrel	Switch off the motor & MCB, adjust the arm shoes of the worm shaft.	The Worm Shaft will rotate freely and the machine can be operated for production.

Frequent breakage of safety bolts	1	Check if hard materials like stone are available in the soil	Need to change the soil or to sieve the soil to remove stones	
	2	Check if hard materials like dry soil lumps are available in the soil	Need to age the soil properly (minimum 36 hours), as instructed during training period.	
	3	Check if the moulds are obstructed by the scrapper	Switch off the machine and adjust the springs of the scrapper. If the elasticity of the spring is reduced, then change the spring	.
	4	Check if the moulds are obstructed on the sliding platform	Check the quality of every mould. If any deformation occurred, then rectify it at a local workshop (who has the skill and tools for Stainless Steel work) also check the Rubber liner on the side guiding system if required change the rubber. Check the cleanliness of the rollers Platform. Clean by water, check the movement and position the platform at its original position. Check the linearity of the mould side guiding frame with rubber liner. If it is not, then adjust it by the loosening the bolts and tighten after setting it right.	Adjust the bolts at the 4 corners of the sliding platform, to set the gap, so that the moulds can move freely, but check clay is not leaking out over the moulds. Check the mould place rightly and sliding along the guiding liner. The Machine can be operated for Production.
Bricks are not shaping properly	1	Check the water percentage of the soil in the barrel	If excess water, then stop feeding water and feed dry soil till the mix comes upto the mark	Assume soils are being tested at Lab.
	2	Check the proper ageing of the soil.	To get conditioned soil, every soil needs to be aged properly for minimum 36 hrs.	The Machine can be operated for Production.
Moulds are not cleaning properly	1	Check the pressure of the water jet at the cleaning chamber	Open the stopper at the end of the pipe (in the cleaning chamber) and clean the pipe. After cleaning if the water pressure is not upto the mark, then open the stop valve at the top of the water tank. If then the water pressure is not upto the mark, then open the stopper and clean the 4" diameter pipe at the bottom of the top water tank.	Assume every day, water in the bottom tank is drained out and thus clean the bottom and top water tanks properly. The header needs to be cleaned on every week. The Machine can be operated for Production.

Maintenance



Maintenance Schedule

Daily

Clean and drain out the dirty water by unscrew the outlet of the water tank (at the bottom of the machine) as shown in 1, 2 & 3.

Chronologically

Clean the soil from the different working zones like soil scrapper assembly, moulds etc. The mould sliding track needs to clean by water and with a piece of cloth (Refer to 4, 5, 6).



Method of Cleaning the Machine

Check the tightness of all nuts and bolts

Weekly

- Oiling on the bearing
- Greasing on the gears and chain-sprocket
- Clean the barrel and every joints of worm assembly
- Clean the residue of clay from the water pipes
- Check the alignment of the gears, chain-sprocket, bearings, keys etc.
- Check the seal and joints of the water pipeline
- Check the moulds assembly
- Check the air pressure of the rubber tyres
- Tighten the flange of the seal to prevent the leakage of soil



Checking of Seals and Joints of Water Pipeline

Monthly

- Check the gear tooth, chain-sprockets, belt-pulley, wheel of the stroke arm, mould sliding rollers
- Clean the residue of clay from the 4" diameter pipe at the top of the machine
- Check the rubber liner on the mould guiding system.



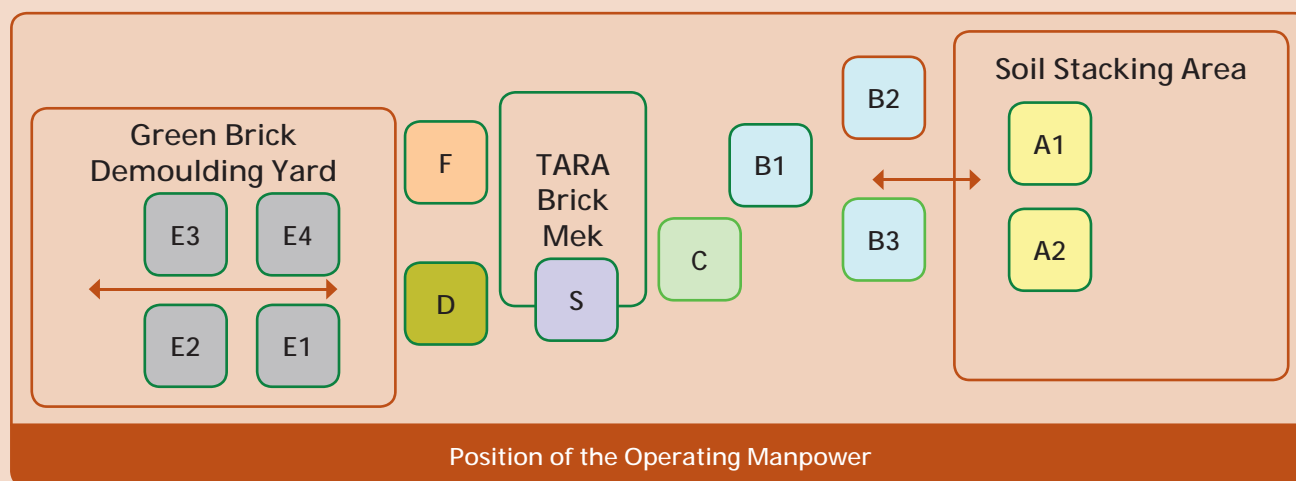
Cleaning of Residue of Clay from the 4" Diameter Pipe

Production Management



Production Management

Based on the operational sequence in the TARA BrickMek, the involvement of manpower is detailed in the chart below:



S. No.	Operation	Persons	Activity
A	Soil Filling in Container	2	Persons involve in soil preparation and afterward filling soil in the pan
B	Soil Carrying for feeding	3-4	Persons carry the pan with soil from the Soil stacking area to TBMM and feed into the hopper of the machine
C	Mould Positioner	1	Person needs to pull the cleaned empty mould from the cleaning chamber then spray parting sand and position that before the pushing arm. He/she needs to synchronies with the timing of the pushing arm
D	De-moulding from the Sliding table	1	Person needs to shift the filled mould that slides on the sliding table to the transfer trolley
E	Mould transferring and ejection of green bricks	4-5	Persons need to carry the filled moulds on the transfer trolley to the demoulding yard for demoulding the green bricks. After demoulding, persons need to carry the empty mould to the cleaning chamber and manually keep them on the floor.
F	Mould in Cleaning chamber	1	Person needs to put the empty mould in the cleaning chamber for washing.

To supervise the complete production system, a **SUPERVISOR** needs to be appointed to monitor all the activities that can match the timing of the machine operation. He also monitors the soil and water in the barrel in the machine. He needs to stand on the top of the machine to monitor all the operational activities.



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KNOWLEDGE PARTNERSHIP PROGRAMME



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